REMARKS

Claims 1, 3-5, 6-10 and 11 are all the claims pending in the application.

Election/Restriction

As a preliminary matter, Applicants wish to note that, as a result of Applicants' election of method claims 1-5 for examination, as a result of a restriction requirement that the Examiner memorialized in the Office Action dated April 23, 2003, original apparatus claims 6-9 were indicated as being withdrawn. However, claim 10, which is directed to an apparatus made by a method, was part of the non-elected group II but was not included in the Office Action comments. Unfortunately, Applicants did not catch this omission and, when a new claim was added in the response filed on July 11, 2003, it was designated as claim 10, rather than claim 11.

The omission of original claim 10 from the group of non elected claims now has been recognized by the Examiner and he has required it to be added to the group of non-elected claims. The error in numbering the new claim also was caught by the Examiner when he issued the final Office Action dated September 22, 2003. Applicants note that the new claim has been renumbered as claim 11.

Claim Rejections - 35 U.S.C. § 112

Claims 1-5 and 10-11 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The Examiner asserts that the subject matter of these claims was not described in the specification in such a way as to convey to one skilled in the art that the Applicants had possession of the invention at the time the application was filed. The Examiner notes that claim 1 recites a heating step with respect to the formation of a thin single crystal film. The Examiner notes that the teachings at page 13, lines 1-6 and page 11, lines 1-7 are inadequate. This rejection is traversed.

Applicants respectfully submit that the limitation "heating the substrate under existence of a raw material containing C or Si, or C and Si to induce surface chemical reaction between said raw material and Si or C contained in the substrate, thereby forming the thin single crystal film" recited in claim 1 is clearly supported by the description in the instant specification.

At first, as previously asserted, the specification describes formation of the SiC layer using Si as the substrate and C_2H_2 as the material gas on page 11, lines 1-17 in conjunction with Figs. 3 and 4. In this case, a silicon source is not contained in the material gas. From this, it is

directly and uniquely derived that the SiC layer is produced by the reaction which takes place above the substrate surface between Si in the substrate surface and C_2H_2 as the material gas.

In addition, this feature is also supported by the description of page 15, line 24 to page 16, line 3. Specifically, as described there, the flow rate and the partial pressure were 20 sccm as the C_2H_2 flow rate, 100 sccm as the H_2 flow rate, and 6×10^{-3} Torr as the C_2H_2 partial pressure. After the substrate surface reached 1350℃ ,the substrate was retained for 5 minutes in the above-mentioned mixed atmosphere of C_2H_2 and H_2 to thereby form the single crystal SiC layer to a thickness of about 10nm.

From this teaching, one of ordinary skill would directly and unambiguously understood that the thin single crystal SiC layer is formed by the surface chemical reaction (in other words, thermally assisted chemical reaction) which takes place above the substrate surface between Si in the substrate surface and C_2H_2 as the material gas. It is noted that one of ordinary skill would not understand that Si present inside the Si substrate reacts with C_2H_2. Rather, he would naturally understand that Si present on the surface of the Si substrate reacts with C_2H_2.

Withdrawal of the rejection is respectfully requested.

Claim Rejections - 35 U.S.C. § 103

Claims 1, 3-4 and 11 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kito et al (6,110,279) in view of Cook et al (6,352,594) and Admission. This rejection is traversed for at least the reasons presented with respect to the rejection of claims 2 and 5.

Claims 2 and 5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kito et al (6,110,279) in view of Cook et al (6,352,594) and Admission, and further in view of Funato et al (5,882,807). This rejection is traversed for at least the following reasons.

As a preliminary matter, Applicants note that they have amended claim 1 by incorporating certain key limitations recited in claim 2, and by specifying the value of the temperature elevating rate. The limitation with respect to the value (the temperature elevating rate equal to or higher than 150℃/minute) is clearly supported by the description of page 11, limes 10-22 and Figs. 3 and 4.

Claim 2 has been canceled and claim 5 has been amended to change "the single crystal SiC layer " into the thin single crystal SiC layer" for consistency.

The distinguishing features of the present invention are focused on the deficiencies of the patent to Funato. The Examiner admits to certain deficiencies in Kito et al and Cook et al and Admission, with respect to claims 2 and 5. Applicants respectfully submit that Funato fails to remedy the deficiencies in the primary references on the basis of several differences.

First, according to the present invention, prior to the formation the thick SiC layer by CVD, the thin single crystal SiC layer is formed by the surface chemical reaction in order to reduce the defects. Thus, the thin single crystal SiC layer is not formed by CVD according to the present invention.

By contrast, according to Funato, the thin SiC film is formed on the Si substrate by CVD. On the other hand, according to the present invention, the thin SiC film is formed on the Si substrate by the surface chemical reaction instead of CVD. The surface chemical reaction is clearly different from CVD in the chemical mechanism.

Second, in Funato, the temperature elevation rate is 5-50℃/min (see col. 4, lines 12-17). The preferable range falls within 10-30℃/min. Furthermore, Funato teaches that if the temperature elevation rate exceeds 50℃/min, thermal stress may be produced in the SiC substrate, which tends to cause cracks in the substrate. Thus, Funato positively excludes the temperature elevation rate not lower than 50℃/min.

By contrast, according to the present invention, the temperature elevation rate is equal to or higher than 150℃/minute, as described on page 11, lines 10-22. The value of the temperature elevation rate is specified from the following reasons. Specifically, if the temperature elevation rate is equal to or higher than 150℃/minute, the density of the etch pits and the dome-like protrusions formed on the surface of the SiC layer is remarkably reduced so that the single crystal layer with high-quality can be obtained, as described on page 11, lines 10-13.

Moreover, if the temperature elevation rate is equal to or higher than 150℃/minute, the size of the etch pits is remarkably reduced so that the SiC layer high-quality can be formed, as described on page 11, lines 18-22.

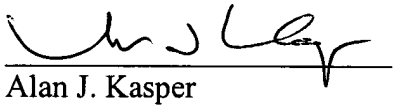
In addition, it is apparent from Figs. 3 and 4 that the effect of the present invention can not be obtained within the range of the temperature elevation rate (5-50℃/min) of Funato.

On the basis of the above-discussed reasons, the present invention is clearly patentable over the combination of the cited references because (1) the Kito et al, Cook et al and Admission are deficient by the Examiner's own admission, and (2) Applicants have demonstrated that Funato does not disclose the subject matter of the present invention recited in the above-amended claim 1.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



Alan J. Kasper
Registration No. 25,426

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: December 22, 2003